



## Usage Policies Notebook for CHA Thermal Metal Evaporator

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# Emergency Plan for CHA Thermal Metal Evaporator

## Standard Operating Procedures for Emergencies

### Contact information

Person	Phone number
Lab Manager	Jake Hes, 949-824-8239 (day), 562-522-8328 (alternate)
Director	G.P. Li: 949-824-4194 (day), 949-824-2047 (alternate)
Staff	Mo Kebaili: 949-824-8239 (day), 949-494-5892 (alternate)
Super User	Carlos Ruiz (818) 527-6349 (Anytime, voicemail or text only)

### Hazardous chemicals, gases, and conditions

Hazard name	Description of hazard
Vacuum	Implosion
High temperature	Burn or ignition source
High voltage	Electrical shock, ignition source
Isopropyl alcohol	Flammable solvent
N <sub>2</sub> (nitrogen) gas	Asphyxiant

### Alarms or indications of danger

Alarm type	Condition and response
Alarm on console	Problem with state of process. Halt process. Correct problem or notify staff or lab manager before continuing.
Pungent or foul smell	Shutdown machine at once Contact staff and lab manager.

**Emergency shutdown plan #1**

In the event of an emergency, when there is very little time, turn off the main power to the DC power supply, this will shutdown the high voltage system. Leave the facility at once, and then contact the lab manager or the staff.

**Emergency shutdown plan #2**

In the event of an emergency, when there are a few minutes available, shut down the DC high voltage supply and place tool in the stand-by mode. Leave the facility at once, and then contact the staff and the lab manager.

# Usage Policies for CHA Thermal Metal Evaporator

## Standard policies for usage

The CHA-SEC-600-RAP/Flashsource evaporator a four-source with wire fed system used for depositing aluminum other materials need to be cleared with staff. The SCR power supply is rated at approximately 100 amperes. The wafers are loaded onto a rotating planetary substrate holder. The system will pump down to the base pressure of  $2e-6$  Torr using a cryo pump. The pumping speed is typically two hours. The deposited material thickness is controlled by using an INFICON model XTC/2 crystal monitor. To verify the deposited metal thickness, use the Dektak or the Alphastep surface profilometers.

### Contact information

The INRF staff or the lab manager can be reached at 824-8239 or 824-9831.

### Authorized users

Only the INRF registered users who have completed the training and passed the certification may use this equipment. The users may only use the portion of the system for which they have been trained.

### Training

The users must have received direct training from the staff in order to use this equipment. The users are expected to understand the nature of the system, as well as the proper control and use of the crystal monitor. Training varies slightly, depending on the material to be deposited on the substrate. Contact the staff for details or to arrange for a training session.

### Usage logs

The users are required to log all activity in the log sheets provided. All users must log when they use the evaporator (date and time), which material they deposited, and when they completed their process in the user log sheet. If the users notice anything unusual, they should record it in the user log sheet, and add details in the maintenance log sheet. Any maintenance to the tool must be logged in the maintenance log sheet (maintenance staff only).

### Safety equipment

There is no specific safety equipment for use on this tool, however, cleanroom gloves and tweezers should be used when handling substrates in the evaporator chamber. Care should be taken not to avoid hitting their head on the chamber or pinching their fingers upon lowering the hoist.

### Standard equipment and materials

The laboratory provides the following gas:  $N_2$ . Other gases must be cleared with the lab manager.

## **User maintenance**

Users are requested to clean the chamber after use by first, vacuuming the base of the chamber then wiping the rim down with the isopropanol alcohol. The users should dispose of the cloth in a waste container marked for flammable solid waste.

## **Waste disposal**

Dispose of broken glass and broken wafers in the appropriate container. Dispose of alcohol soaked wipes in a waste container marked for flammable solid waste.

## **Scheduling**

Reservation can be done on-line also the system can be used on a first-come, first served usage if no reservation was made.

## **Other issues**

Users should record the base pressure on the log sheet prior to venting the chamber.

Users should remain physically present at the tool during evaporation to monitor the deposition rate and the current set point, and they should also monitor the chamber pressure during operation.

On completion of the evaporation, the system should be left in the idle mode, with the high vacuum valve open. Users should record the roughing time into the log sheet.

Any new materials introduced into the system need to be cleared with the lab manager or the staff.

At no time should a user adjust a system pressure regulator.

## **Non-standard use**

Users may not modify any hardware on this equipment. For the usage of non-standard processes, gases or materials, contact the staff or the lab manager.

# Usage Notes for CHA Thermal Evaporator

## Guide for using the Metal Evaporator correctly

### Thermal Metal Evaporator (Flash source system)

Follow these steps for evaporation of metal on a silicon or glass substrate.

#### 1. Initial System check:

- a. The system is not in used by other lab users.
- b. Check the log sheet and verify that the system was working properly with the last user.
- c. The high voltage power supply is **off**.
- d. Verify that the chilled water valve is turned **off** at the system.
- e. The high vacuum valve is **open** to the chamber.
- f. The chamber ion gauge pressure reads  $< 5 \times 10^{-6}$  Torr, unless the system was recently used.
- g. There is liquid nitrogen (LN<sub>2</sub>) for the megasorb pump.
- h. The cryo pump temperature is below 20K.
- i. The compressed air is open and at 80 (psig).
- j. The N<sub>2</sub> gas is open and at 30 (psig).
- k. Fill the megasorb pump with LN<sub>2</sub>.

#### 2. Venting the chamber:

- a. Logon to the tool computer with your user name and password.
- b. Fill out the log sheet, and record the actual chamber base pressure.
- c. Turn **off** the ion gauge.
- d. Close the high vacuum valve. Once the valve is closed wait a few seconds then go to the next step.
- e. Open the vent valve to vent the chamber to atmosphere. The pressure indicator will read 7.4+2 to verify N<sub>2</sub> will be escaping from the lower vacuum seal of the bell jar.
- f. Toggle the hoist rocker switch to the up position until the two arrows match on the side of the bell jar. Toggle the hoist rocker switch to the standby position.

#### 3. Inspect the chamber:

- a. Inspect the chamber for peeling, particles and material splatters. Vacuum and wipe off the chamber if necessary.
- a. Check for proper operation of the shutter by opening and closing before lowering the hoist to close the chamber.
- b. Load the metal sources into the boats or into the baskets, or use the existing aluminum wire feeder.
- c. Check the log sheet or the thickness monitor to verify if a new crystal is needed, ask the staff to change the crystal if necessary.
- d. Check that the boats or the baskets are visible through the mirrors. Replace the mirrors (bare silicon) if needed.

#### 4. Loading Substrate

- a. Open the shutter.
- b. Record the metal sources boats or baskets locations.
- c. Load your samples onto the substrate holder. Use the Kapton (polyimide) tape to secure the samples.
- d. Wipe the full circumference of the base plate and the bell jar seal using clean wipes and ensure that the o-ring is properly seated up against the bell jar.
- e. Lower the bell jar, by toggling the hoist rocker switch to the down position until the bell jar rests on the base plate, and then toggle the hoist rocker switch back to the standby position (center).

**5. Pump down chamber:**

- a. Open the roughing valve by turning on the roughing rocker switch on the auto-tech II controller.
- b. Monitor the roughing pumping speed to assure that the chamber was positioned correctly and record the roughing time on the log sheet.
- c. Wait until the chamber pressure drops below  $<70$  mTorr ( $7.0 \times 10^{-2}$ ).
- d. Close the roughing valve by switching off the rocker switch on the auto-tech II controller.
- e. Open the high vacuum valve by switching on the rocker switch on the auto-tech II controller.
- f. When the convectron gauge reaches the maximum scale, turn on the ion gauge.
- g. Wait about two hours for the chamber to be pumped down to a base pressure below  $5 \times 10^{-6}$ .

**6. Program thickness monitor (Deposition controller)**

- a. Push the POWER switch. Check to see that the POWER and START/CONT switches remain illuminated.
- b. After a 10-15 seconds warm-up, check to see that the Display index appears.
- c. Press DSPL Film number Enter the parameters will be shown. Notice that you are entering 0 in some parameters, thereby deleting them. Be sure to enter 0 (press 0 key followed by E key) if it appears; do not merely go on to the next parameter.
- d. After programming go to the Executive display (DSPL 7); enter the active film number (if it is not already) by pressing film number then E. The executive should appear.
- e. Go to the Data display (#8). Check that the film number entered (Press FLM# number) the display should appear (Note that the crystal life number will appear).
- f. Push START to begin run. Observe the run indications on the Data display. Note that the power indication will flash when the unit max power.

**7. Deposition:**

- a. Start the deposition process.

**8. Venting and Unloading the Chamber:**

- a. Turn off the ion gauge.
- b. Close the high vacuum valve by pushing the rocker switch on the AUTO-Tech II to close and wait 10 seconds for the valve to close before going to the next step.
- c. Open the vent valve by pushing the rocker switch on the AUTO-Tech II to open. Wait until the chamber pressure reaches  $7.4 \times 10^{-2}$  on the Convectron gauge.
- d. Verify that  $N_2$  is escaping from the bell jar and the base plate seal.

- e. Toggle the hoist rocker switch to the up position on the AUTO-Tech II until the bell jar clears the planetary. Toggle the hoist rocker switch back to the standby position. Remove the planetary from the system then remove the samples.
- 9. Chamber pump down:**
- a. Place the planetary onto the holder back into the chamber.
  - b. Wipe the full circumference of both sides of the bell jar seal and the base plate using clean wipe and verify that the o-ring is properly seated.
  - c. Lower the bell jar by toggling the hoist rocker switch to the down position on the AUTO-Tech II until the bell jar rests on the base plate, and then toggle the hoist rocker switch back to the standby position (center position of the rocker switch).
  - d. Open the roughing valve by toggling the roughing rocker switch to open on the AUTO-Tech II.
  - e. Monitor the pumping speed of the chamber to insure that the chamber was positioned correctly. Wait until the chamber pressure drops below 50 mTorr ( $5.0 \times 10^{-2}$ ). Record the chamber pressure and the pumping time on the log sheet.
  - f. Close the roughing valve by toggling the roughing rocker switch to close on the AUTO-Tech II wait 5 seconds to close before going to the next step.
  - g. Now open the high vacuum valve by toggling the high vacuum valve rocker switch to the open position on the AUTO-Tech II.
  - h. When the Convectron gauge reaches the maximum scale, of ( $<1.0 \times 10^{-2}$ ) turn on the ion gauge.
  - i. Check the ion-gauge meter display that the pressure is dropping to verify that the chamber is under high vacuum.
  - j. Complete filling out the log sheet and log out of the tool computer.
  - k. Clean up the area.